Comparison of patient outcomes following ankle fracture fixation with or without arthroscopy trend toward improved outcomes with arthroscopy

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Introduction

Ankle fractures are one of the most common types of fractures[1], yet there is currently no consensus about how best to treat these patients. Open reduction internal fixation (ORIF) remains the gold standard treatment for unstable injuries, typically resulting in good to excellent outcomes.[2,3] However, there is a subset of patients that do not achieve a satisfactory outcome, despite adequate reduction.

One possible explanation for these poor outcomes is concomitant intra-articular injury at the time of ankle fracture. Thus, use of arthroscopy at the time of surgery can help identify and treat intra-articular lesions in acute fractures.

While the rate of intra-articular injury associated with rotational ankle injuries has been reported as high as 63-79%,[4,5] there is currently no evidence that arthroscopic intervention changes patient outcomes. This study aims to assess the clinical impact of arthroscopy accompanying ankle fracture ORIF. This is essential to promote positive outcomes while minimizing unnecessary complications and costs.

Methods and Materials

- Retrospective chart review of all patients who underwent operative fixation of bimalleolar or trimalleolar ankle fracture from Jan 2014 to Nov 2018
  - 2:1 comparison of ORIF alone to ORIF with Arthroscopy
  - Recorded:
    - Demographic data
    - Mechanism of Injury
    - Fracture pattern
    - Surgeon
    - Any additional surgical procedures performed
    - Tourniquet time
    - Anesthesia time
    - Arthroscopic findings
    - Complications
- Phone and email surveys
  - PROMIS Global Health Short Form
  - Patient Acceptable Symptom State (PASS)

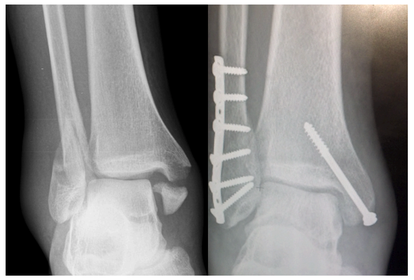

Figure 1. Bimalleolar ankle fracture, before and after ORIF.

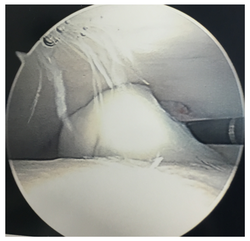

Figure 2. Intra-operative image depicting a large loose body in the lateral gutter of the ankle.

Results of Chart Review

Traditional ORIF group versus ORIF with arthroscopy group:

Groups were similar at baseline:
- Demographics (age, sex) between groups were statistically similar
- Injury mechanisms and fracture patterns were statistically similar between the groups except for a higher percentage of medial malleolus fractures in the ORIF alone group (Table 1)

General Findings:
- Complication rate and mean tourniquet time were equivalent between groups
- Proportion of patients with Kellgren-Lawrence osteoarthritis scores of 0 or 1 similar between groups
- No significant predictors based on injury mechanism, fracture category, preoperative factors

Arthroscopic findings:
- 28% of patients had full thickness osteochondral defects
- 49% of patients had a small, partial thickness cartilage defect
- 34% of patients had loose bodies requiring removal
- Overall, 48% rate of arthroscopic intervention beyond the standard debridement of synovitis/hematoma
- Weber C fibula fractures were less likely to have a loose body noted on arthroscopy (5.9% versus 42.6%, *p* value 0.005)

Injury Characteristic	ORIF with Arthroscopy (n = 71)	Traditional ORIF (n = 142)	Significance (*p* value)
Injury Mechanism			
Fall	46 (64.8)	106 (74.6)	0.134
Sports	21 (29.6)	31 (21.8)	0.214
Motor Vehicle	4 (5.6)	5 (3.5)	0.469
Fracture Pattern			
Weber B	54 (76.1)	104 (73.2)	0.677
Weber C	17 (23.9)	38 (26.8)	0.677
Medial Malleolus	19 (26.8)	59 (43.7)	**0.017**
Dislocation	16 (22.5)	32 (22.5)	0.927
Syndesmosis Injury	40 (47.9)	61 (35.2)	0.065

Values are written as n (%). Boldface indicates statistically significant difference.

Table 1. Groups were statistically similar for every injury mechanism and fracture pattern variable except for percentage of medical malleolus fractures.

Survey Results

Trends

PROMIS Scores:
- Mean physical function score: 42.7 in traditional ORIF group, 44.9 in the ORIF with arthroscopy group (*p* value 0.064)

PASS Scores:
- Considers surgery a success: 89% of traditional ORIF group, 97% of ORIF with arthroscopy group
- Satisfied with function of ankle: 78% of traditional ORIF group, 89% of ORIF with arthroscopy group
- Tibiotalar joint dislocation patients who underwent ORIF with arthroscopy had higher satisfaction rates (90% versus 56%, *p* value 0.098)

Statistically Significant Findings
- Weber B fibula fracture and tibiotalar joint dislocation patients who underwent ORIF with arthroscopy had higher PROMIS physical function scores than traditional ORIF patients
  - 45.9 versus 42.4, *p* value 0.01
- Weber B fibula fracture patients who underwent ORIF with arthroscopy had higher patient satisfaction rates than traditional ORIF patients
  - 93.1% versus 75.5%, *p* value 0.05

Discussion and Conclusions

Prior chart reviews, RCTs, meta-analysis, and systematic review comparing traditional ORIF to ORIF with arthroscopy present conflicting results. Some find no difference in functional outcome scores,[6,7,8] while others report statistically significant improvements in scores.[9,10] The addition of arthroscopy to an ankle ORIF creates a few concerns, including increased surgical time, increased complication rate, and increased cost.

Our study found no difference in complication rate or tourniquet time, which is is in line with many studies on this topic.[6,11] However, there are a number of complications *unique* to ankle arthroscopy, the majority of which are nerve injuries. Further research is necessary to delineate which patients are best suited for ankle ORIF with additional arthroscopy.

Based on our study, patients that underwent ankle arthroscopy at the time of an ankle fracture ORIF had better patient reported outcomes when compared to traditional ORIF, particularly in cases of Weber B fibula fractures and tibiotalar joint dislocations.

References

1. Court-Brown and Caesar, "Epidemiology of Adult Fractures."
2. Burwell and Charnley, "The Treatment of Displaced Fractures at the Ankle by Rigid Internal Fixation and Early Joint Movement."
3. Lindsjö, "Operative Treatment of Ankle Fracture-Dislocations. A Follow-up Study of 306/321 Consecutive Cases."
4. Loren and Ferkel, "Arthroscopic Assessment of Occult Intra-Articular Injury in Acute Ankle Fractures."
5. Hintermann et al., "Arthroscopic Findings in Acute Fractures of the Ankle."
6. Thordarson, Bains, and Shepherd, "The Role of Ankle Arthroscopy on the Surgical Management of Ankle Fractures."
7. Fuchs et al., "Effect of Arthroscopic Evaluation of Acute Ankle Fractures on PROMIS Intermediate-Term Functional Outcomes."
8. Gonzalez et al., "Arthroscopically Assisted Versus Standard Open Reduction and Internal Fixation Techniques for the Acute Ankle Fracture."
9. Lee et al., "Effectiveness of Arthroscopically Assisted Surgery for Ankle Fractures."
10. Takao et al., "Diagnosis and Treatment of Combined Intra-Articular Disorders in Acute Distal Fibular Fractures."
11. Ono et al., "Arthroscopically Assisted Treatment of Ankle Fractures."

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